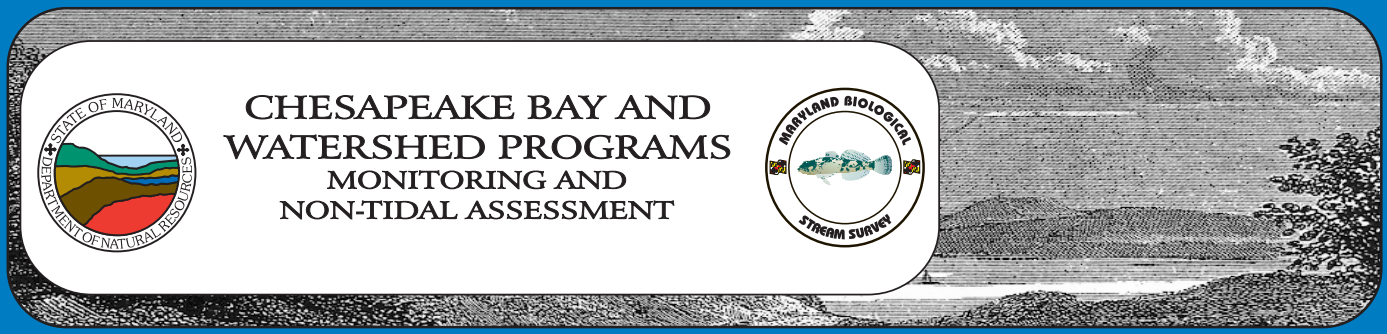
MARYLAND STREAM WADERS VOLUNTEER STREAM MONITORING MANUAL

MARYLAND DEPARTMENT OF NATURAL RESOURCES
MONITORING AND NON-TIDAL ASSESSMENT DIVISION

1-877-620-8DNR(x8623)
email streamwaders@dnr.state.md.us



Parris N. Glendening
Governor

Kathleen K. Townsend
Lieutenant Governor

A message to Maryland's citizens

The Maryland Department of Natural Resources (DNR) seeks to preserve, protect and enhance the living resources of the state. Working in partnership with the citizens of Maryland, this worthwhile goal will become a reality. This publication provides information that will increase your understanding of how DNR strives to reach that goal through its many diverse programs.

Sarah Taylor-Rogers
Secretary

Stanley K. Arthur
Deputy Secretary

Maryland Department of Natural Resources
Tawes State Office Building
580 Taylor Avenue
Annapolis, Maryland 21401

Toll free number: 1-(877) 620 8DNR x8611
www.dnr.state.md.us

FOR FURTHER INFORMATION REGARDING THIS REPORT, PLEASE CALL 410-260-8611.
OR TOLL FREE : 1 (877) 620-8DNR x 8611

PRINTED ON RECYCLED PAPER

Maryland Stream Waders
Volunteer Stream Monitoring Manual

Compiled by
Daniel Boward

Maryland Department of Natural Resources
Monitoring and Non-tidal Assessment Division
Tawes State Office Building, C-2
Annapolis, Maryland 21401

February 2000

Contents

Welcome to Stream Waders

Thank you for joining Maryland Stream Waders, sponsored by Maryland Department of Natural Resources (DNR), Monitoring and Non-tidal Assessment Division. The year 2000 is the inaugural effort for this new statewide volunteer stream monitoring program. If this Pilot year is successful, we hope to make statewide stream volunteer monitoring an annual activity and an integral part of the Maryland Biological Stream Survey (MBSS). Thus you are a part of stream monitoring history in Maryland!

The Maryland Biological Stream Survey is a statewide program to monitor and assess the chemical, physical, and biological quality of small to medium sized freshwater streams. Results from the MBSS are used for reporting stream conditions, researching the relationships between watershed conditions (such as land use) and the quality of the streams that drain them, and, most recently, for water quality regulations. The U.S. Environmental Protection Agency is recommending that the MBSS serve as a National model for other state's stream monitoring programs. Now in its 7th year, the MBSS has sampled well over 1,200 stream sites in Maryland. But we need to do more. That's where you come in!

One important goal of Stream Waders is to increase the density of stream sampling sites beyond the capabilities of DNR staff. During the past "round" of the MBSS (1995-1997) DNR sampled an average of 7 stream sites per medium-sized watershed (about 80 square miles). With the help of volunteers like you, we hope to increase this number to more than 25!

The goals of Maryland Stream Waders are:

- ***To increase the density of sampling sites for use in stream quality assessments***

- ***To improve stream stewardship ethics and encourage local action to improve watershed management***

- ***To educate the local community about the relationship between land use and stream quality***

- ***To provide quality assured information on stream quality to state, local, and federal agencies, environmental organizations, and others.***

What is the volunteer commitment?

DNR is recruiting volunteers from across Maryland to help with the program. Two commitments from volunteers are needed: 1) attendance at one of five Saturday training sessions held during February 2000, and 2) commitment to sample 20 sites (one time only) either on your own or with team members.

What's the watershed connection?

The fairly small subwatersheds (about 8 square miles each) to be sampled by Stream Waders are the primary sampling units of the program and our goal is to sample each of them during the spring. These subwatersheds are also parts of the larger watersheds being sampled by MBSS crews from DNR and the University of Maryland during spring 2000. Thus Stream Waders data will be quite compatible with those collected by MBSS, having been collected in the same watersheds during the same time with the same methods. The map of Maryland in Appendix I shows these larger watersheds to be sampled in the year 2000.

What's being sampled?

Benthic macroinvertebrates (aquatic insects, crustaceans, snails, etc.) will be sampled using the same methods and "sampling window" (March and April) as that

used by MBSS crews. Samples will be preserved in the field and identified by DNR benthic taxonomists at the DNR field office in Annapolis.

How will sample results be made available?

DNR staff will provide results of all sampling on its Web site, via email or through regular mail to those volunteers wishing to have them. All efforts will be made to have these results available in a timely manner.

What are the steps needed to complete Stream Waders sampling?

1) Attend one of five training session being offered in February 2000

2) Choose subwatersheds for sampling

During your training session, you will be asked to choose a group of small subwatersheds (about 8 square miles) to sample. You may wish to sample subwatersheds that are close to home or you may be adventurous and wish to travel.

3) Locate DNR/County priority sites or choose your own sites.

4) Sign a volunteer form for insurance purposes

5) Sample!

You may sample anytime during March and April 2000.

6) Arrange for delivery of samples, forms, and equipment to DNR.

Site Selection and Landowner Permission

Sites should be sampled upstream of a bridge or within a short walk from a road, if possible. Color topographic maps with streams, roads, and subwatershed boundaries will be available. These maps also show the locations of public (state or county owned) lands. Copies of ADC or DeLorme Gazetteer maps (NOTE: there are no ADC maps available for Garrett, Allegheny, or Somerset counties) will also be included in your map package (see Appendix II). After identifying which subwatershed(s) you wish to sample, select your sites as follows:

1) The highest priority sites are those marked on your ADC or DeLorme maps as "DNR Priority" or "Local Government Priority". Try to sample as close as possible to the locations indicated on the map. Streams containing these priority sites have been identified by DNR or a county or city government as in need of further monitoring. After sampling is completed, DNR will use your locational data to match your sampling locations with priority sites.

2) Choose your own sites according to these guidelines:

   a. sample a site inside but near the "outlet" of the subwatershed;
   b. distribute your sites as evenly as possible among the streams in the subwatershed;
   c. choose a variety of stream sizes to sample within the subwatershed;
   d. sample streams that are of particular interest to you (note on the Comments Form why the stream is of interest to you).

Private landowner permission forms will be included in your package. You must get written permission from private landowners prior to sampling on their property. If you choose to sample on public lands, as indicated on your color topographic map, permission is not needed prior to sampling.

Safety

Safety is important to everyone. To have a successful and safe sampling program, caution should be used while sampling your stream site.

Safety Guidelines

1) Always take a buddy.

2) Be cautious of fast or deep waters. Stream currents can be very strong.

3) Wear shoes or waders that are in good condition and have traction. Never wear sandals or open-faced shoes.

4) ALWAYS OBTAIN PERMISSION TO CROSS PRIVATE PROPERTY TO GET TO A SAMPLING SITE. Be sure that the landowners know exactly when and where you will sample.

5) Contact your nearest health department or Maryland Department of the Environment [(410) 631-3000] for specific warnings regarding local streams. Some stretches of streams may be subject to high levels of pollutants.

6) Carry a first aid kit.

7) Leave wildlife alone. Do not disturb the vegetation on the streambanks or feed wild animals.

8) Bring a change of clothes in case you get wet. Stream water is usually quite cold in March and April.

9) Watch traffic while parking near your sample site and getting in and out of your car. Display your DNR Stream Waders logo prominently in your windshield.

10) Avoid getting Synasol (alcohol) on your skin. If you do, wash immediately with plenty of water. Make sure all alcohol containers (carboy and benthic sample buckets) are tightly sealed and are secure in your vehicle.

Stream Survey and Benthic Sampling

Although DNR will use benthic community data to report on the overall quality of the stream, it is important to gather some other information that may help us identify the location of your site and to understand why the stream was rated as it was.

Upon arrival at your sampling site, turn on your GPS unit (push the PWR button). **IMPORTANT!!! BE SURE TO ACQUIRE A NEW SATELLITE LOCK EACH TIME YOU BEGIN A NEW SITE.** The unit should be placed in a secure but open area. If the unit does not "see" at least three satellites after about 5 minutes, move it to another place and continue trying. If the unit fails to "see" at least 3 satellites at the end of your sampling, be sure to give a good description of the sample site on the Comments Form. NOTE: DO NOT PUSH "MENU", THEN "ENTER" AS THIS MAY CHANGE IMPORTANT PRESET NUMBERS. Refer the GPS Directions handout and the Manual for details on how to use your unit.

Use your GPS unit to record the latitude and longitude of your sampling site. Try to take the readings within 150 feet of where you sample for benthos. The best readings are made where there are no overhead obstructions such as trees and tall buildings. If necessary, you may take the readings on the side of the road near the sample site. Watch traffic!

Observe the stream conditions upstream of the bridge (if you are sampling at a bridge). Has there been a storm lately? Is the stream exceptionally high and fast? If so, you may wish to revisit the site later. Do not sample if the water is dangerously fast!

If possible, approach your sample site from downstream. Do your best to choose a sampling area that is uninfluenced (or minimally influenced) by any nearby roads. For example, try to sample upstream of the right-of-way along the bridge that most likely has no tree cover. Choose a small section of stream (about 100 feet) from which to sample.

Overview of Benthic Sampling

The intent of benthic sampling is to obtain a sample most representative of the best available habitats within your sample section. The sample collection will allow for the calculation of a Benthic Index of Biotic Integrity (B-IBI) to be used to assess the health of the sampled stream.

Sample Period

The standard sampling "window" is March 1 through April 30. This is the same sampling window for all MBSS benthic collections.

Habitats to be Sampled

A combination of habitats supporting the most diverse macroinvertebrate community within a sample section will be sampled qualitatively. In order of preference, habitats to sample are:

1) riffles
2) undercut banks and their associated root mats
3) submerged vegetation, and
4) snags

Riffles in the mountain and piedmont regions will likely have boulder or cobble stones, while those in the coastal region will likely have gravel or sand.

Taking your benthic sample

1) First, be sure that your net and sieve bucket have no holes or remnants of the previous sample. If either has holes, repair them before sampling! Label the sample bucket with your name, the subwatershed number, the site number, and the sample date. Have your teammate verify the correctness of the label and indicate so on the survey sheet.

2) Survey the stream section to locate the most productive habitat(s) from the list above. Sample each habitat in proportion to its prevalence at the site. For example, if your site contains a large, well-developed riffle with a few undercut banks containing root mats, sample mostly riffle (≈80%) and some root mats (≈20%).

3) If sampling a riffle, start at the downstream edge and place the net firmly in the substrate. Disturb the substrate with your feet in an area the width of the net and, at most, two net widths upstream. Rub by hand any large sticks and/or stones from the disturbed area to dislodge any tightly-clinging organisms. Repeat this process at the upstream edge of the riffle. Because benthic community composition is known to vary with stream velocity and substrate size, try to sample the range of substrate types and velocities found within the riffle. Repeat as needed until about 20 square feet of substrate has been sampled. If only log and snag substrates are available, 20 square feet of surface area should be rubbed off by hand. **CAUTION: When disturbing and removing substrates, be aware of the possibility of sharp objects such as broken glass.**

4) When sampling habitats other than riffles or snags, the D net should be used in a jabbing/sweeping motion to dislodge organisms from root mats, submerged vegetation, etc. Kicking of the habitat prior to jabbing may also be done as needed to dislodge organisms. A minimum of 20 square feet should be sampled. In soft substrates, the net motion should be more gentle to minimize the collection of detritus. Multiple habitats may be sampled to cover the best available substrates (see list above).

5) When a 20 square foot sample has been obtained, or when the D net becomes filled to the point that water does not pass easily through it, the net should be washed into the sieve bucket. While the sample is in the sieve bucket, all large stones, debris, leaves, etc., should be carefully washed, inspected for organisms, and discarded. Try to put as little material (such as rocks, sticks, and leaves) as possible into the sample bucket. Also, while rinsing the sample in the sieve bucket, remove salamanders and fish that may have been swept into the net during sampling.

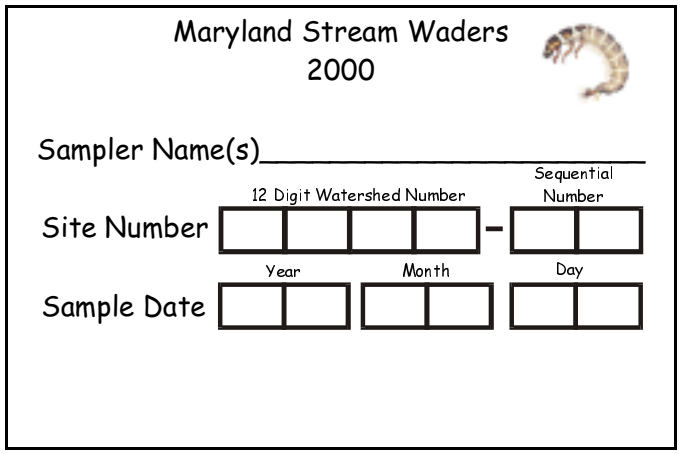
   Transfer the sample to a labeled (see below) sample bucket and add alcohol to just cover the sample material. At each sample site, benthic collection should not exceed 15 minutes.

6) The lid to the sample bucket should be verified tight (after proper labeling) and the sample readied for transport. Verify that the D net is clean and clear of clinging organisms.

Labeling your benthic sample container

Proper labeling of your benthic sample is critical! If the container is rendered unidentifiable for whatever reason, the sample may not be used. The denatured alcohol (Synasol) used to preserve the samples is an excellent solvent! Ordinary ball point or felt tip pen will turn into disappearing ink when exposed to Synasol. Thus, it is critical that all writing on the labels be done with ***PENCIL***.

Sample bucket labels are preprinted with the following prompts for information:



Use the following convention when labeling your sample buckets:

Sampler Name(s): Write the first and last names of each member of the sampling team.

Site Number

In the four squares labeled **12 Digit Subwatershed number**, write the unique four digit number that corresponds to the 12 Digit Subwatershed containing the stream you are sampling. This number is indicated on the laminated color topographic map of each 12 Digit Subwatershed.

In the two squares labeled **Site Number**, indicate which site you are sampling within the corresponding 12 Digit subwatershed (you assign the numbers beginning with #1). For example, if you are sampling within subwatershed # 0341, and you sample five sites within that subwatershed, your site numbers will be: 0341-01, 0341-02, 0341-03, 0341-04, and 0341-05). DNR staff will later assign a site code to each of your samples.

Sample Date: Write the date (YY/MM/DD) you collect the sample.

Complete two labels for each bucket. Place one inside the bucket on top of the sample material and affix the other to the outside wall of the container using adhesive preprinted label provided. NOTE; it is best to affix the outside label prior to collecting the sample, as the label will not stick as well if the bucket is wet. If you know where and when you will be sampling before you leave home, you may label your buckets in the comfort of your living room.

Equipment and Sample Retrieval and Chain of Custody

After taking your benthic samples and filling out all your Site Survey Form, and Comment Form, you have two choices for transfer of your samples, equipment, maps, and forms to the DNR laboratory in Annapolis:

1) You may bring your samples, equipment, maps, and forms to a Rendezvous Day to transfer these items to DNR. Date and location to be announced at your training session.

2) Deliver the samples and equipment yourself to DNR's field office in Annapolis (after calling the Stream Waders hotline to make arrangements for your delivery). During your visit to the field office, you will be given a tour of the benthic macroinvertebrate laboratory and get a first hand look at how DNR processes and identifies these creatures.

3) If delivery of your samples during the Rendezvous Day will be difficult, you may call the Stream Waders hotline to make arrangements to have your samples picked up from your home.

Prior to your samples being transferred to DNR, please keep the buckets in a dry place out of doors, such as in a garage. Store the equipment in a safe and secure place.

When you transfer your samples, make sure your Chain of Custody Form is filled out according to the instructions in Appendix V. This form must be transferred to the person receiving your samples.

Equipment and Supplies

Each team of Stream Waders volunteers will be provided with the following equipment and supplies at the training sessions:

- GPS (Global Positioning System) unit (1)
- D net (1)
- Sieve bucket (1)
- Benthic sample buckets with lids (*)
- Paper labels for benthic sample buckets (*)
- Carboy with about 4 gallons of alcohol (1*)
- Waterproof Site Survey Form (*)
- Land owner permission letter (*)
- Laminated topographic map of sampling subwatershed (*)
- Photocopy street maps of sampling subwatershed area (*)
- Pencil for labeling benthic samples (1)
- Clipboard (1)
- Site Survey Form (*)
- Comments Form (*)
- Chain of Custody Form(*)
- Stream Waders hat (1 per person)
- Windshield sign (1)

(*) indicates number of item will vary according to the number of sites sampled.

Quality Assurance/Quality Control

In the Field

- At least one person from each sampling team must receive training from DNR biologists.

- A subset (at least 5%) of sites collected by Stream Waders will also be sampled by DNR biologists. Follow-up analyses will indicate comparability in sample findings.

In the Lab

- All samples will be subsampled and identified at DNR's benthic laboratory in Annapolis by trained sample processors and taxonomists.

- All subsampled organisms, sample sortate, and vouchers will be retained at the DNR laboratory.

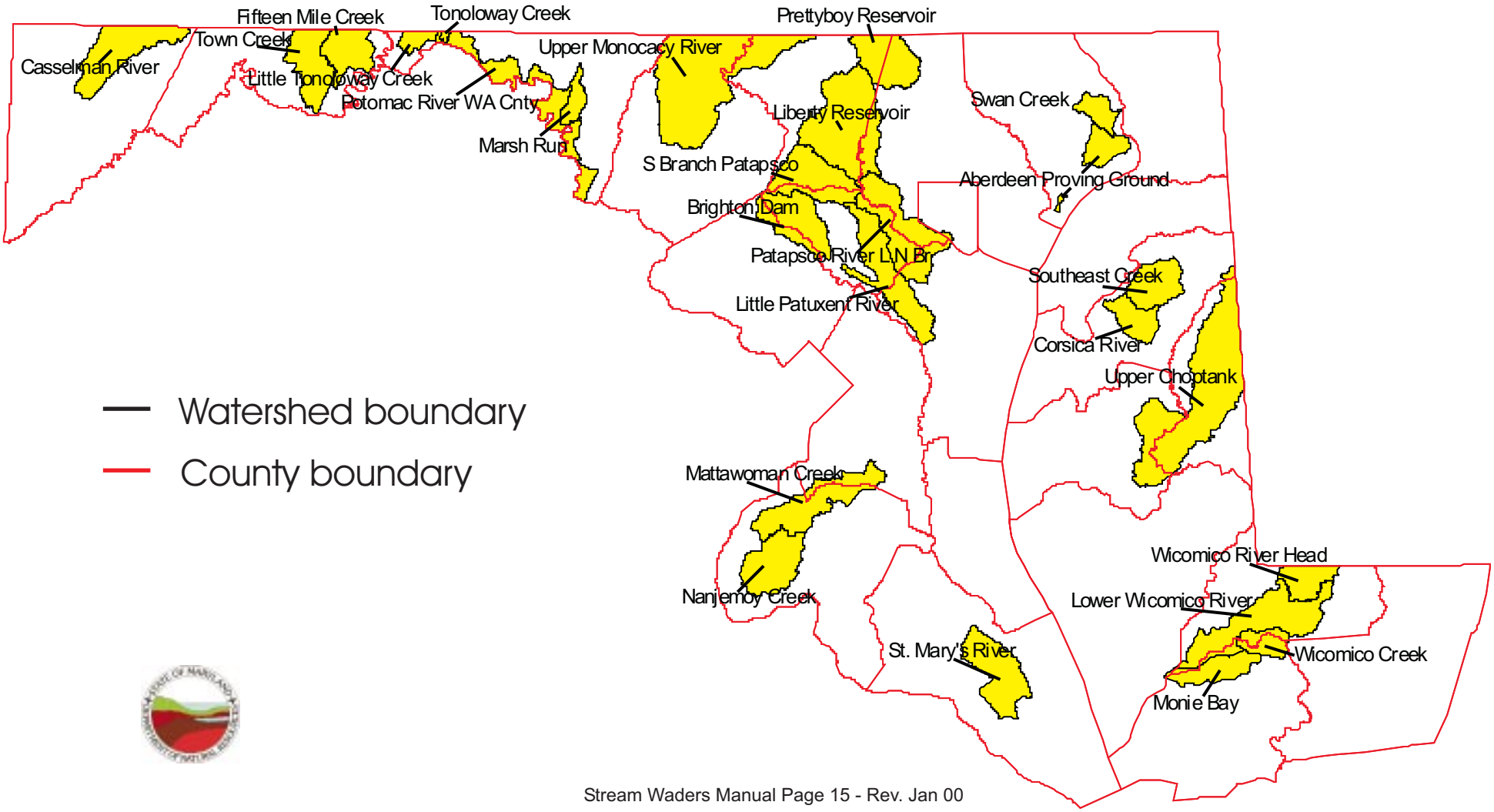
Data entry and management

- Once identified, site taxa lists will be entered into the same database as that used for the MBSS. The same quality control checks will apply to both data sets.

- Stream Waders data will be maintained at DNR in the same file format as those for the MBSS.

Year 2000 Maryland Biological Stream Survey Sampling Watersheds

Maryland Department of Natural Resources
Monitoring and Non-tidal Assessment Division



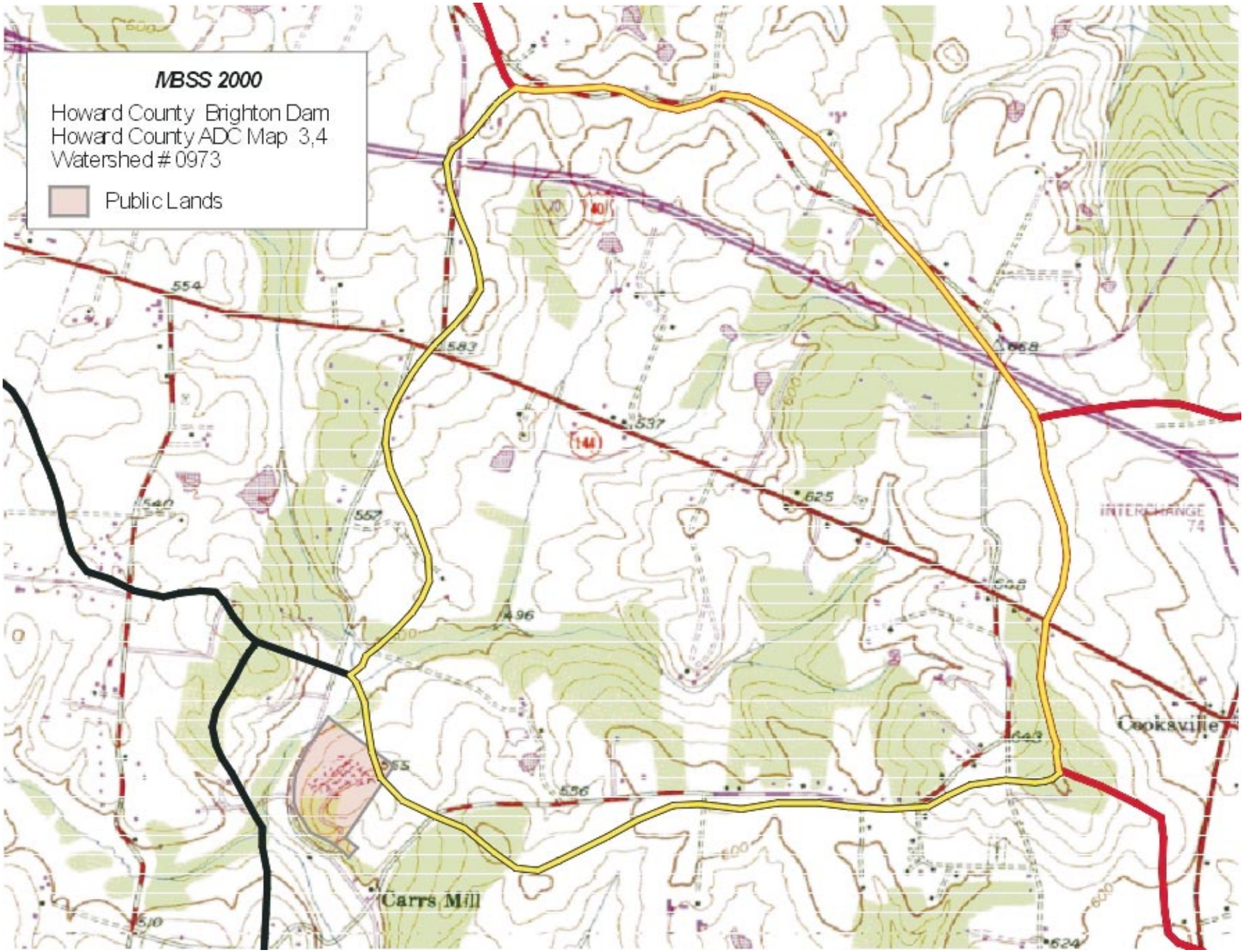
Appendix II

This set of four maps is an example of the map package used by Stream Waders volunteers to locate sample sites. The first map is a portion of a 1:24,000 scale topographic map showing the outline of the 12 Digit subwatershed to be sampled. The area of the subwatershed under public ownership is also shown. The second map is for referencing the corresponding ADC book map pages containing the subwatershed. The third and fourth pages are detailed ADC book map pages for the corresponding county containing the 12 Digit subwatershed. These last two maps may have DNR/County priority sampling areas indicated on them.

Note:

For those of you sampling in Garrett, Allegheny, and Somerset counties:

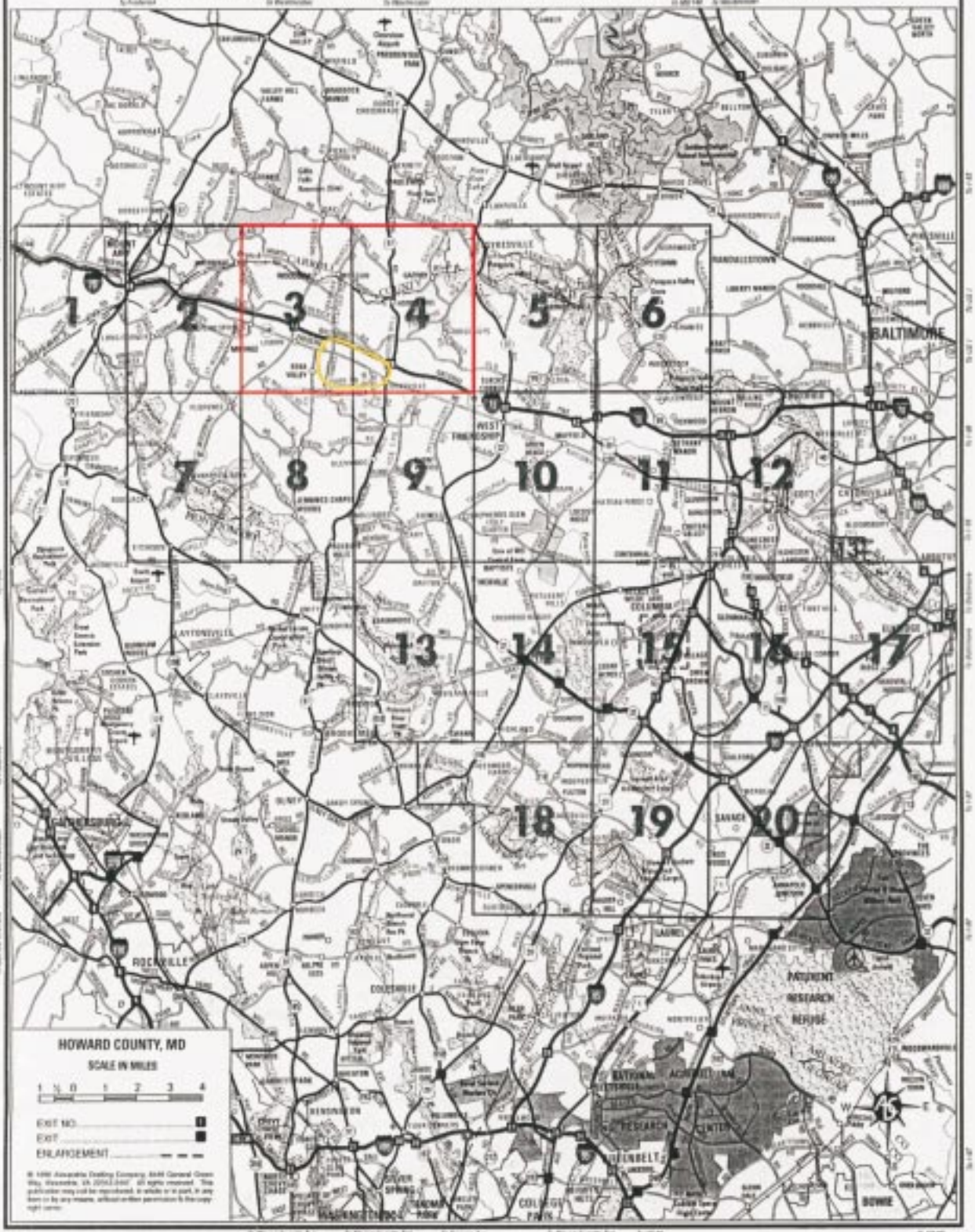
There are no ADC books maps for these counties. Your map packages include copies of the DeLorme Maryland/Delaware Atlas and Gazetteer for reference.


MBSS 2000
Howard County Brighton Dam
Howard County ADC Map 3,4
Watershed # 0973
Public Lands
Carrs Mill
Cooksville

HOWARD COUNTY, MD

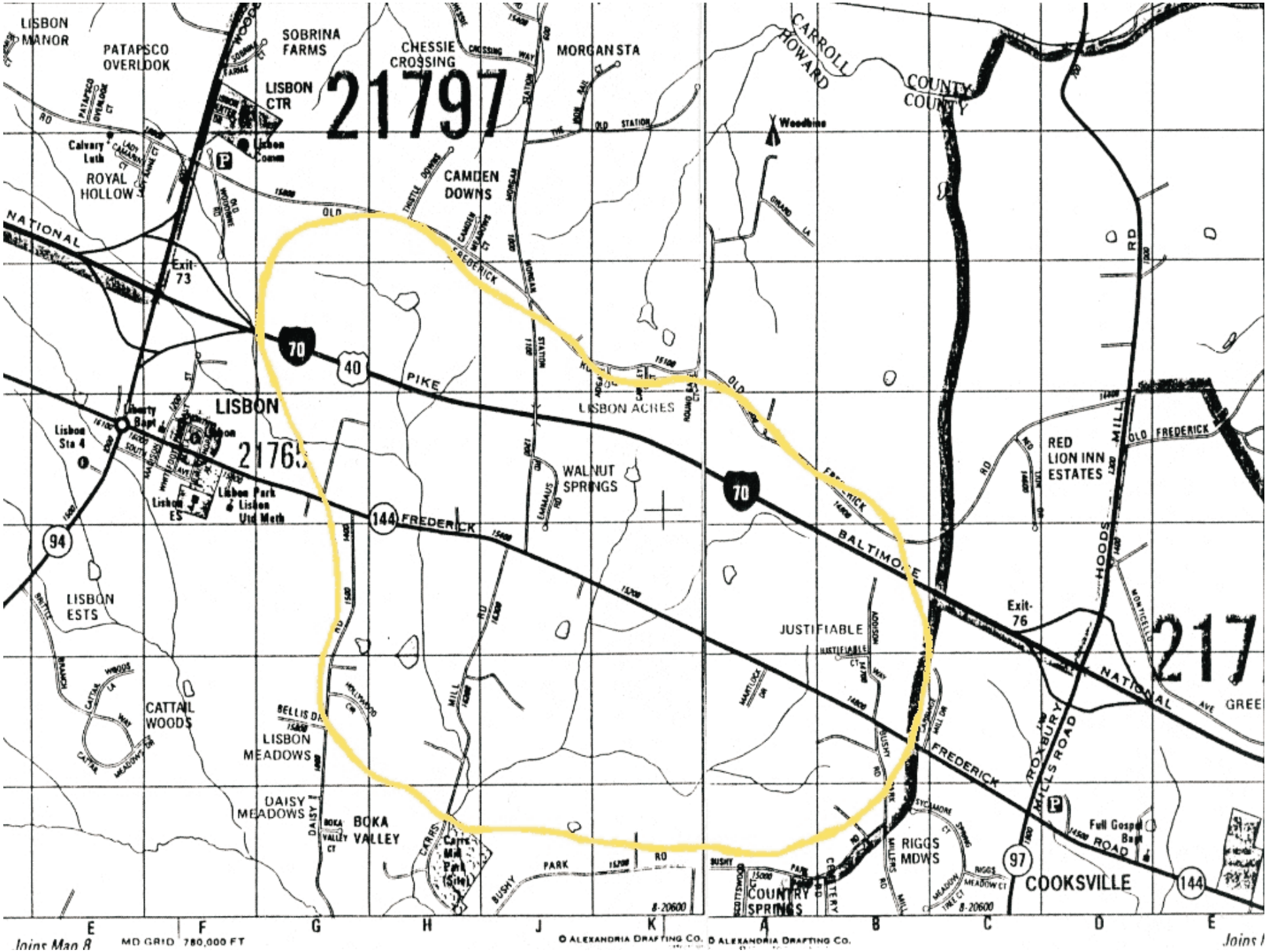
INDEX TO MAPS

Pages 2,3 and 4 provide you a complete Step-by-Step guide to using your Street Map Book, Map Legend, Table of Contents and Key to Abbreviations. Take a few minutes to familiarize yourself with this time saving information.



Howard County is also available as a sheet map.

For additional ADC Maps and Charts please see the inside back cover.


21797
LISBON MANOR
PATAPSCO OVERLOOK
SOBRINA FARMS
CHESSIE CROSSING
MORGAN STA
LISBON CTR
CARROLL HOWARD COUNTY
Woodbine
Calvary Luth
ROYAL HOLLOW
CAMDEN DOWNS
NATIONAL
Exit 73
70
40
PIKE
LISBON
LISBON ACRES
Lisbon Sta 4
Liberty Bapt
Lisbon Park
Lisbon Vol Meth
WALNUT SPRINGS
RED LION INN ESTATES
144
FREDERICK
94
LISBON ESTS
JUSTIFIABLE
Exit 76
CATTAIL WOODS
LISBON MEADOWS
DAISY MEADOWS
BOKA VALLEY
RIGGS MDWS
COUNTRY SPRINGS
ROXBURY MILLS ROAD
Full Gospel Bap
97
COOKSVILLE
MD GRID 780,000 FT
© ALEXANDRIA DRAFTING CO.

Appendix III

Site Survey Form

The Site Survey Form is intended to provide key information about the location and basic description of each sample site. Since DNR will incorporate locational data (latitude and longitude) into the MBSS database, it is essential that these readings be accurate. Also, please be as accurate as possible in your descriptions of each sample site. DNR will use the non-biological information you collect (such as stream width, etc) to provide insight into why the benthic community is healthy or not healthy. Please thoroughly read the following guidance below before filling out the Site Survey Form.

Please use a sharp pencil to complete the Site Survey Form. PLEASE COMPLETE THE ENTIRE FORM. Write legibly and complete as many fields as possible. If an entry for a field is not known, place a strike through line above the underline on the Form (e.g., County ~~_____~~).

Field Form Verification (upper right corner)

Initials

Place the initials of the person filling out the form on the line labeled Initials

Reviewer

Place the initials of the person reviewing the form on the line labeled Reviewer

Name(s) of sampler(s)

Enter the full names of each person on your Stream Waders team. ***NOTE****: at least one member of the team must complete a training session.*

Date sampled

Enter the sampling date in the format noted (YY/MM/DD, where Y is the two digit year, M is the two digit month, and D is the two digit day)

Time

Enter the time using hours and circle either AM or PM.

Stream name (if known)

Enter the most likely name of the stream you are sampling. Names may be obtained from the color topographic map, the ADC or the Gazetteer map provided. If the stream name is unknown, but you know the name of the next stream downstream, call your stream Unnamed Tributary to... (name of next stream downstream) .

Latitude

Enter the latitude of your site from your GPS unit in Degrees, Minutes, and Seconds, as indicated. Remember to reset your GPS unit at each site.

Longitude

Enter the latitude of your site from your GPS unit in Degrees, Minutes, and Seconds, as indicated.

Nearest road (or intersection)

Enter the name of the nearest road (at the bridge or closest to your site) using the ADC or Gazetteer map. If your site is near an intersection, enter Road A X Road B (e.g., Smith Lane X Taylor Ave.)

County

Enter the name of the county.

Map Grid (ADC or Gazetteer page and grid)

Enter the page (e.g., 06) and grid (e.g., D-6) containing your site from either the ADC map or the DeLorme Gazetteer map atlas, if available.

Site Number (12 Digit Subwatershed Number plus sequential number)

Enter the number of your 12 Digit Subwatershed (from the color topographic map). Sequential numbers 1 through 5 are pre-entered. If you are sampling the third site in Subwatershed number 0433, your Site Number will be 0433-03.

Average Stream width

Circle the appropriate size (Small, Med., Large) using the following criteria :

Average stream width less than 10 feet = Small
Average stream width between 10 and 30 feet = Medium
Average stream width greater than 30 feet = Large

If you wish, you may use your D net to measure the approximate width of the stream in meters. Take your measurement in a place that you think is of average width. The total length of your net is 5 feet and each black mark on the handle is 5 centimeters. Otherwise you may simply pace off the distance or visually estimate the width.

Stream depth (centimeters)

Using your D net handle, measure the approximate depth of the stream in a place that you think is of average depth. Each black mark on the D net handle is 5 centimeters.

Benthic Habitat Sampled (total=20 square feet)

Indicate in square feet which benthic habitats were sampled at your site. The total should be 20. For example, if your site contains mostly riffle and a few undercut banks with rootwads, sample about 18 (enter 18; one digit per box) square feet of riffle and 2 (enter 02; one digit per box) square feet of rootwads. Sample your habitats according to their approximate proportion at your site. If you sample habitats other than those listed, enter them in the blank labeled "specify here_____".

Appendix IV

Comments Form

Use the Comments Form to jot down any unusual conditions in the stream such as strange odors or water color, large algae growths, discharges into the stream, high flows, extremely turbid water, etc. Note activity on the land near the stream such as cows grazing in or near your site, construction, etc. You may also wish to simply describe the beauty of the stream.

Use this space to briefly describe why you sampled at this site. For example you may specify that your watershed organization would like information on the health of this stream, or that this was a site recommended by DNR for sampling.

Your comments may provide DNR with valuable insight into potential stream impairment sources or information on high quality streams.

Maryland Stream Waders 2000

Comments Form

Use the Comments Form to jot down any unusual conditions such as strange odors or water color, large algae growths, discharges into the stream, high flows, extremely turbid water, etc. You may also wish to simply describe the beauty of the stream. Your comments may provide DNR with valuable insight into potential stream impairment sources.

Site Number (12 Digit Subwatershed Number plus sequential number) ☐☐☐☐–☐☐

Site Number (12 Digit Subwatershed Number plus sequential number) ☐☐☐☐–☐☐

Site Number (12 Digit Subwatershed Number plus sequential number) ☐☐☐☐–☐☐

Site Number (12 Digit Subwatershed Number plus sequential number) ☐☐☐☐–☐☐

Site Number (12 Digit Subwatershed Number plus sequential number) ☐☐☐☐–☐☐

Appendix V

Use the Chain of Custody form to keep track of the transfer of your benthic samples from one person to another. Each form has enough space for 20 samples.

Enter the site number (subwatershed number followed by sequential number; e.g., 0345-02) in the first column for each of your samples being transferred. Use one row of the table for each sample bucket. Place your first initial and last name in the "Delivered by" column and have the person to whom you are delivering the samples place his or her first initial and last name in the "Delivered to" column.

Use the space at the end of the form (back side) to record any comments you may have regarding your samples or their transfer. For example, you may note that sample 0345-02 has a small crack in the lid. This will alert the recipient of any potential problems with the sample.

Maryland
Stream
Waders

Chain of Custody Form

Site Number	Delivered by	Delivered to	Date	Delivered by	Delivered to	Date	Delivered by	Delivered to	Date

Site Number	Delivered by	Delivered to	Date	Delivered by	Delivered to	Date	Delivered by	Delivered to	Date

Comments